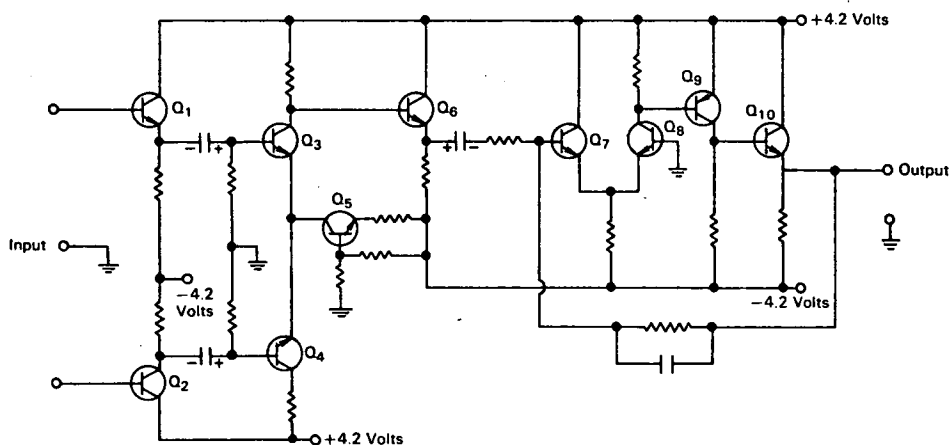


NASA TECH BRIEF



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Tiny Biomedical Amplifier Combines High Performance, Low Power Drain



The problem: To facilitate biomedical studies on mobile subjects, develop a miniaturized, high-performance, high-reliability, battery-operated, solid-state amplifier of low power consumption, that is suitable for both general biomedical use and space research. Amplifiers meeting the requirements of physiological research are available commercially, but they are often too bulky and require too much power for many applications. Small amplifiers have been developed but often with compromise of some aspect of performance.

The solution: A transistorized, portable, high-performance amplifier that utilizes a differential input to obtain a common-mode rejection of 25,000 to 1. Because of its small size and low power drain it may be mounted directly on an ambulatory subject.

How it's done: Transistors Q₁ and Q₂ are emitter followers and provide the necessary high input impedance of about 10 megohms differential. The differential output of the emitter followers is converted to a

single-ended signal by a difference amplifier consisting of Q₃, Q₄, and Q₅. Transistor Q₅ provides the difference amplifier with the high emitter impedance necessary for high common-mode rejection. The signal is fed sequentially through an emitter follower Q₆, a second difference amplifier Q₇ and Q₈, a common emitter amplifier Q₉, and a final emitter follower Q₁₀. Capacitance coupling in these stages is minimized to provide good low frequency response from 0.15 cps. The amplifier exhibits a gain of 1,000 while drawing 5 milliwatts of power.

Notes:

1. This amplifier has been constructed in a welded cordwood configuration with dimensions of 2.0 cm by 1.7 cm by 0.9 cm and weighing 4.5 grams.
2. This device should find application in the biomedical field for amplifying electrocardiogram and electromyogram signals.

(continued overleaf)

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California, 94035
Reference: B65-10203

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

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